

SCIENCE

NEW YORK, NOVEMBER 20, 1891.

THE SCIENCE AND ART OF GOVERNMENT.¹

GOVERNMENT should be looked upon as the business agency of the nation, and the science and art of government are the science and art of conducting this business agency. The various branches of administration have arisen through pressure from without. Everything that the people have demanded to be done with sufficient unanimity and persistence has been eventually undertaken by the government. One bureau after another has been created by law, placed in charge of proper officers, and conducted to the best of the latter's ability. Most bureaus have grown and expanded in their scope and usefulness. Many have been several times reorganized and the service perfected.

Although the various systems of administrative operation have been largely empirical, devised by men who had little preliminary preparation for the work, improved through the growth and demands of the service, and brought to perfection by thoughtful study of the needs of the public in each individual case, still the whole rests on a rational basis and constitutes a great system of government. The general laws and principles underlying this system constitute the science of government. The carrying out of these laws and principles is the art of government, and although, as in the case of almost all the practical arts, it was empirically developed, there is no reason to doubt that it will be as greatly improved and perfected by its reduction to a science and its enlightened prosecution as such as all the other great industrial arts have been since science has been applied to them.

Among the most promising sources of advantage in the scientific method is the comparative study of government operations. While from a very broad point of view all government is the same, when viewed at all in detail the greatest individual differences are found. Much of this diversity grows out of the natural differences in the conditions of nations, but fully as much is due to the differences in the methods adopted to accomplish the same purpose. Amid all these varying methods there must be great differences in their efficiency. Some are coarse and clumsy, while others are precise and refined. There are all the grades that exist in the manifold mechanical devices of the other arts, those which are best being always those which have most thoroughly utilized natural forces, including the social forces.

The scientific study of government would make the comparative study of methods a leading feature, with a view to the recommendation of those which under all circumstances are the very best. This is only one out of any required number of illustrations that might be given of the superiority of the scientific method in government.

In the science of political economy the subject of government operations is destined to occupy an increasingly prominent place. It is safe to say that no chair of political economy in any institution of learning has ever taught or attempted to teach the practical workings of public adminis-

tration—the way in which the business of a nation is conducted. It is impossible to teach this branch of political economy without the means of a direct examination of the different systems of government business as they are conducted by their respective bureaus. Each great system, such as those of finance, land, patents, etc., would require a course of lectures, with repeated visits to the departments, inspection of records, books, papers, merchandise, etc. This would require a legal right to prosecute the study in this only practicable way. Nothing short of a national institution, created and authorized by law to teach the science and art of government, could successfully carry out this scheme of education. As a safeguard to our institutions, not less than as means of national progress and enlightenment, no other educational scheme is equal to it in importance.

A NATIONAL UNIVERSITY, ITS CHARACTER AND PURPOSE.¹

THE National University recommended by Washington, Jefferson, Madison, and many later presidents and statesmen is almost certain to be realized in the near future. It is the object of this paper to offer some hints as to what ought to be its character and purpose.

In the first place, it should be distinctly national, the creature of the American people and devoted to their use and needs. To this end it should be located at the seat of government and should be exclusively the product of the federal government. It should also be in the fullest sense representative, as is the government itself. Its scholarships should be held entirely by Americans, and should be distributed with local uniformity throughout the entire domain of the United States. Recognizing the intellectual homogeneity of the whole American people, it should have representatives from every section of the country. This could probably best be secured by allotting a given number of scholarships to each congressional district on the basis of representation as determined by the census enumeration. Candidates should be admitted by competitive examination held by the faculty or an examining board appointed by the faculty, to be absolutely free from all political influence. As the intellectual homogeneity of the American people relates to capacity and not to attainment, in order to secure such universal representation, the university should be accompanied by a preparatory department, and those who pass the examination for the university should have no advantage over those who pass for the preparatory department, except that, if a sufficient number pass for the former, examinations for the latter need not be held. Candidates who enter the preparatory department should be given precedence over those from the same district at the end of that course for admission to the university.

The faculty should be chosen by a commission consisting of the most eminent scholars and scientific men in the country, who are entirely above personal and political bias, such, for example, as the National Academy, the Board of Regents

¹ Read before Section I of the American Association for the Advancement of Science, at Washington, D.C., by Lester F. Ward, Aug. 20, 1891.

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of the Smithsonian Institution, and other high authorities in the leading departments of learning.

While the institution should be a university in the fullest and widest sense, it should differ from all other universities in one important respect. All universities have their strong chairs, and many rest their reputation on some one leading feature. The leading feature and true reason for being of the national university should be its course of instruction in the science and art of government. This course should differ radically from the usual courses in political economy and political science. These should not be neglected, but in addition to them and of higher range should stand as the basis of university instruction a thorough and exhaustive course in the practical workings of government itself. Viewing government as the great agency for the transaction of the people's business, every department of government business should be fully taught both in its principles and its practice, so that the graduate from the national university should come forth in full possession not only of all that constitutes true statesmanship, but also of the practical details of each of the many great business operations which the government undertakes and carries on.

The administrative offices of the government should be filled as soon as possible from graduates of the university, so that at length the civil service force of the United States should consist exclusively of persons who have had a thorough training in the theory and practice of government.

PRINCIPLES AND METHODS OF GEOLOGIC CORRELATION BY MEANS OF FOSSIL PLANTS.¹

THE value of paleontology to geology depends primarily upon the principles by which the paleontologist is guided in the application of his data, and accordingly upon the methods he adopts in bringing such data to bear upon the questions which geology presents for solution. This is especially true of paleobotany, and the chief reason why that branch of paleontology has thus far been so little help to geology is that unsound principles or improper methods have been employed in reasoning from paleobotanical data.

Among the leading principles by which the paleobotanist should be guided may be mentioned the following:—

1. It should not be expected that widely separated deposits having similar floras are necessarily identical in age, since the present well-known laws of geographical distribution are likely to have been operative to a greater or less degree in past geologic ages, and the flora of the entire globe has probably never been homogeneous throughout. Different deposits may therefore be homotactically correlated without being contemporaneous, while, on the other hand, those having very different floras may have really been contemporaneous.

2. The great types of vegetation are characteristic of the great epochs in geology. This principle is applicable in comparing deposits of widely different ages where the stratigraphy is indecisive. For example, in rocks that are wholly unknown, even a small fragment of a carboniferous plant proves conclusively that they must be paleozoic, or a single dicotyledonous leaf that they must be as late as the cretaceous.

3. For deposits not thus widely different in age, as, for example, within the same geological series or system, ample material is necessary to fix their position by means of fossil

plants. As this is the most common case, it is the neglect of this principle that has led to the greater number of errors and done most to bring paleobotany into disrepute. The geologists have expected too much of paleobotanists, and the latter have done violence to the truth by attempting to satisfy the extravagant demands of the former. On the other hand, where the material is ample fossil plants are as reliable as any other class of paleontologic data.

4. The correct systematic determination of fossil plants concerns biology and does not concern geology. Much of the contempt exhibited in some quarters for paleobotany has arisen from the impression that there is great uncertainty with regard to the true nature of vegetable remains. This uncertainty is greatly exaggerated even by botanists, who are apt to imagine that nothing can be known of a plant without having all its organs and parts before them. But the geologist need not be affected in the least by these discussions, since all that is required from his point of view is that the fossil be definite, constant, and easily recognizable, as is usually the case with plants. Such as possess these qualities and are also characteristic of a given deposit have their full diagnostic value independently of the question whether their true systematic position has been determined or not.

As regards methods in geologic correlation by means of fossil plants, it is chiefly important that the tables of distribution be complete and comprehensive; that is, that they embrace all the forms found elsewhere, and that all the other localities and formations in which they occur be indicated. It is also important when comparing floras as ancient as the Mesozoic, that those species be enumerated which are obviously related to those of the deposit to be determined. In the discussion of such tables of distribution due regard should be had for the fact that the types of earlier floras often pass up into later ones, and when the latter are much more abundant than the former their occurrence argues much more strongly for the earlier than for the latter date—for the Devonian than the Carboniferous, and for the Cretaceous than for the Tertiary. Many serious errors have been committed by ignoring this principle.

NOTES AND NEWS.

THE public meetings of the Nineteenth Century Club, New York, during the coming season, will be held on the following Tuesday evenings, viz., Nov. 17, Dec. 15, Jan. 12, Feb. 16, Mar. 15, and Apr. 12. There will be six conversational meetings of the members of the club during the coming season, to be held upon the first Friday evening in each month.

—The following papers were entered to be read at the November meeting of the National Academy of Sciences: Some Aspect of Australian Vegetation, and The Nomenclature of Vegetable Histology, by G. L. Goodale; On Certain New Methods and Result in Optics, by Charles S. Hastings; An Exhibition of the New Pendulum Apparatus of the United States and Geodetic Survey, with Some Results of its Use, and On the Use of a Free Pendulum as Time Standard, by T. C. Mendenhall; On Degenerate Types of Scapula and Pelvic Arches in the Lacertilia, by E. D. Cope; The Proteids or Albuminoids of the Oak-Kernel (second paper), by Thomas B. Osborne, introduced by S. W. Johnson; Astronomical Methods of Determining the Curvature of Space, by C. S. Pierce; On Geographical Variation among North American Birds, considered in relation to the peculiar Intergradation of *Colaptes Auratus* and *C. Cafer*, by J. A. Allen; On the Variation of Latitude, by C. Chandler; The Tertiary Rhynchitidae of the United States, by Samuel H. Scudder; On a Color System, by O. N. Rood; Preliminary Notice of the Reduction of Rutherford's Photographs, by K. Rees, introduced by E. C. Pickering; On the Application

¹ Read, by Lester F. Ward, before Section E of the American Association for the Advancement of Science, at Washington, D.C., Aug. 21, 1891; a translation into French was also read in part before the International Congress of Geologists at the same place, Aug. 29, 1891.

Spectrum Analysis to the Analysis of the Rare Earths, and a New Method for the Preparation of Pure Yttrium, by H. A. Rowland; A Nomenclator of the Family of Fishes, by Theodore Gill; Measurement of Jupiter's Satellites by Interference, by A. A. Michelson; The Follicle Cells of Salpa, by W. K. Brooks.

— The council of the Appalachian Mountain Club has been informed by Mr. Henry Brooks of West Medford that if \$2,000 can be provided for the care of the property, Virginia Wood, situated in Middlesex Fells, on the north side of the Ravine Road, will be given into the keeping of the Trustees of Public Reservations. The council recommends this project to the favorable consideration of the members of the Appalachian Mountain Club, reminding them that this work is in the line of the club's work and that the club called the meeting which resulted in the incorporation of the Trustees of Public Reservations. Offers of large or small subscriptions may be sent to Mr. Henry Brooks, West Medford, or to the recording secretary of the club. The club's Exhibition of Botanical Specimens will be held the second week in December.

— At what elevation is the air of London purest? According to Mr. W. J. Prim, who gave evidence before the Select Committee on House of Commons Ventilation, says the *Pall Mall Gazette*, at about thirty or forty feet from the ground. Lower than that you get the dust, higher than that you get the smoke from the chimneys. Mr. Prim made certain experiments with frames of wood covered with blanketing material put at different elevations — one on the top of the clock-tower at Westminster, another on the highest point of the roof, and others at various heights down to the court-yard. After five-hours' exposure there were found to be more smuts at high elevations than at the low, but on the level of the courtyard there were considerable quantities of dust. On the whole, Mr. Prim came to the conclusion that the purest level was between thirty and forty feet, and that nothing was gained by going higher, unless you went very high indeed — say, some 400 or 500 feet. All this is rather fatal to the common notion that the highest stories of the tallest blocks of flats are especially desirable for their salubrious air.

— "If any evidence of the fury of the equinoctial storms that have lately raged in the Atlantic were needed, in addition to the lengthening list of 'Disasters at Sea' which has appeared daily during the past three weeks," says the *London Spectator*, Oct. 31, "we might find it in the number of ocean-birds which have been driven from distant seas, and even from other continents, or the New World itself, and have drifted to the rain-soaked fields of England. No doubt all shore-birds are liable to be driven inland during a gale; but these are rarely, if ever, lost in a storm. Every sea-gull and cormorant, puffin, or razor-bill, has its own home, the particular shelf or ledge of cliff on which it sleeps every night, and from which it launches itself over the sea when the first streak of dawn appears upon the waters. But these are only 'long-shore' birds that can lie snug in harbor, like their rivals the fishermen, and suffer, like them, mainly from the interruption of their fishing. When the true ocean birds, like the petrels, are found scattered inland, dead or dying, as has been the case during the past month, we may safely infer that the weather from side to side of the Atlantic has borne hardly, not only on the ships, but on the friendly birds that love to follow them. Numbers of these, of at least two different kinds, one of which, as a rule, makes the Azores the eastern limit of its ocean range, have appeared on our coasts or inland during the gales. Wilson's petrel has been seen in Ireland, in County Down, and a second is said to have been shot on Lough Erne. The fork-tailed petrel, another ocean species, has lately appeared here in far greater numbers. These birds have been seen in Donegal, and in Argyllshire, in Westmoreland, and in the Cleveland district in Yorkshire. As the last appeared after a strong north-western gale, it seems that it must not only have come in from the Atlantic, but have flown over England before falling exhausted to the ground. They have also been seen in Tipperary, at Limerick, Dumfries, and Northampton. From an account given of these petrels in Argyllshire, it is clear that they retained after their long journey all that misplaced confidence in man which marks their behavior when accompanying ships in

mid-ocean. After five had been shot by the owner of a yacht in Loch Melfort, they settled on the vessel, and one allowed itself to be caught under the sou'wester hat of a sailor."

— During the nine years and six months preceding December, 1884, there had occurred in Japan, according to statements published in the *Illustrated American* five hundred and fifty-three earthquakes, averaging one earthquake for every six days and six hours. Professor Milne was able to make the average even greater than this. He could trace an average of an earthquake per day in Nagasaki, in the extreme south of the Japanese Archipelago. Probably the official statistics were compiled from the returns of officials from all over the country, in which case only those shocks which caused loss of life or damage to property would be included. If this hypothesis be correct, we should have an average of more than one earthquake per week, which was so violent that it caused injuries to life or property sufficiently serious to attract the attention of the local authorities, and, in their judgment, to require a report to the central government. Earthquakes being so common, people scarcely notice them unless they be extraordinarily severe ones. For instance, Miss Bird, in her "Unbeaten Tracks," thus summarily dismisses two: "While we were crossing the court there were two shocks of earthquake; all the golden wind-bells which fringe the roofs rang softly, and a number of priests ran into the temple and beat various kinds of drums for the space of half an hour." As every one knows, Japan is the very hearth of earthquakes; in 1854 more than sixty thousand people lost their lives in consequence of one of these great terrestrial catastrophes, and it has been calculated that from ten to twelve earthquakes, each lasting several seconds, occur every year, besides numerous others of too light a nature to be worthy of remark.

— The subject of the use of the flesh of animals killed by poison has been studied by Schmidt-Mulheim with a view to determine whether, if eaten by men, such flesh would be injurious. As reported in the *Revista Internazionale d'Igiene* of Naples, for June, 1891, it may be used without any danger whatever. Many savage races constantly use the flesh of the animals that have been killed with poisoned weapons and have never been injured by that means. Harms has proved (*Univ. Med. Mag.*) that the flesh of animals that have been poisoned with nux vomica and with tartarized antimony is not at all hurtful; Feser has demonstrated the same fact in regard to strychnine and eserine; Spallanzani, Zappi, and Sonnenschein have done the same for arsenic. Froehner and Knudson have made some experiments for this purpose with strychnine and with eserine. They fed dogs with large quantities of mutton poisoned with strychnine and eserine, and they found that no injury whatever was done to the animals. Besides, they themselves ate some of the poisoned meat and drank soup made from it, and found that the flavor was good and had no injurious effects whatever on the system. In regard to the alleged injurious effects caused by the meat of animals poisoned with hellebore, and which had eaten belladonna leaves, the authors have shown that the accounts published in this regard have not been proved and require further tests.

— The experiments in the use of commercial fertilizers on wheat, made at the Ohio Experiment Station, have been criticized on the ground that it is idle to expect any profitable return from fertilizers applied to a soil naturally so rich as that of the farm occupied by the station. This criticism was anticipated when these experiments were instituted, and accordingly a test, duplicating the most important features of the station test, was begun at the same time on a tract of land in Columbiana County, placed at the disposal of the station by its owner for this purpose. The soil on which this test is located has been derived from the decomposition of underlying slate, and is a light colored clay or clay loam, of moderate productiveness, the crops of wheat grown upon it under ordinary farm management having averaged from fifteen to twenty bushels to the acre. It is naturally underdrained by the cleavage of the underlying rocks, but the contour is not so uniform as that of the section devoted to similar tests at the station, and hence the results are less regular. In Bulletin No. 3 of the Ohio Experiment Station for 1891 the results of the experiments for this year on the

station farm are given, the general outcome being that in most cases the use of manure or fertilizers caused an absolute decrease in the product of grain, an immense growth of straw having been produced at the expense of the grain. In summing up the results of this experiment, it was said: "It is expected that this year's results of the duplicate experiment in Columbiana County will show better returns from the use of fertilizers than those of the station test, but it has not been possible to thresh out that experiment in season to publish its results in this bulletin." The wheat was threshed on Oct. 17, and the results show no increase to justify the expenditure on fertilizers.

— At the recent Congress of Tuberculosis, M. Poirier (*British Medical Journal*) read a paper on the surgical treatment of pulmonary cavities. He said the first case on record was accidental. In a duel fought in 1679, the sword of one of the combatants passed through his antagonist's lung and opened a pulmonary cavity. The surgeon utilized the wound for the direct treatment of the cavity, and the patient recovered. In conjunction with M. Jonnesco, M. Poirier has collected all the available statistics, of which the following is a summary. Of twenty-nine cases of incision of tuberculous cavities with resection of ribs, improvement took place in fifteen, cure resulted in four (these cases must, according to M. Poirier, be taken "with every possible reserve"), in nine the result was negative, in one it was unknown. In nineteen of the cases the disease was situated near the apex. M. Poirier, still with the co-operation of M. Jonnesco, has endeavored to simplify the method of operation so as to minimize the amount of traumatism. The following, according to them, is the best way of reaching the upper part of the lung. An incision is made with the thermo-cautery four centimetres below the sterno-costal notch from the middle line of the sternum outwards for nine centimetres in a direction parallel to the first intercostal space; in this way the pectoralis major, which is usually much thinned, is reached, and by enlarging one of the spaces between the fasciculi the plane of the intercostal muscles is reached. This is divided and the pleura exposed. If there are no adhesions it is better to establish them before proceeding further; but if there is a cavity adhesions are always present. It is easy to "strike" the cavity through these adhesions, though a certain thickness of pulmonary tissue has often to be traversed for the purpose. As cavities are generally situated quite in the upper part of the lung, the first intercostal space is at a distinctly lower level than the cavity; the point of the instrument must therefore be carried from below upwards and from before backwards. When the cavity lies towards the back, the spinous process of the seventh cervical vertebra should be sought for; an incision is made outwards from this point towards the scapula; the trapezius and rhomboideus are divided, and the first intercostal space, which is much less wide than it is in front, is reached. Resection of rib may be necessary, but M. Poirier does not advise this. From experiments made on twenty dead bodies, he holds that in front resection of ribs is never called for.

— The Italian Society of the Red Cross has recently been conducting some elaborate experiments to test the working of floating hospitals. In countries where water communication is complete, well equipped hospitals on barges might be of very great service, especially in time of war. The presidents of the Red Cross and Italian Rowing Club, with Captain Olivari of the Italian navy, set themselves to the task, first by forming a floating hospital out of the barges employed on the main water-ways for for the transport of combustibles; then, having got their flotilla in working order, they launched it on the Lago Maggiore (*Lancet*, Sept. 19). Passing thence by canal to Milan, it anchored at the Porta Ticinese, and was there visited by a large number of citizens. It is composed of three barges, two of them fitted up for the accommodation of the wounded, and the third for a pharmacy, a kitchen, and the necessary stores. Of the two hospital barges, one is set apart for wounded officers, the other for wounded soldiers of the line — the two containing twenty-four beds each at present, but capable of including comfortably thirty-six each. These beds are partly on the fracture-board system, partly supported on network of metal, and are all furnished with mattresses

and pillows stuffed with *zostera marina* (dried seaweed), which has the twofold advantage of being non-combustible and antiseptic. Every night-requisite is conveniently at hand, and ventilation is secured by an ingenious canvas awning which gives passage to a continuous circulation of air while protecting the patient from draughts. The flotilla is lighted with oil lamps, and the barge reserved for the wounded officers has accommodation at the prow for the *personnel*, superior and inferior. The store barge consists of a dispensary, an *armamentarium chirurgicum*, a provision magazine, with ice-machines, and a spacious kitchen, capable of supplying 250 mouths. There is also a complete system for storing and keeping cool and pure a perennial water-supply — a system due to the Cavaliere Borroni, secretary to the Milanese Committee of the Red Cross. The flotilla is composed of nine barges in all: the three above described having been sent down to Milan for exhibition from the Lago Maggiore, while the remaining six are in dock at Arona, on the southern extremity of the lake. These barges are moved on the lakes by tugs, on the rivers by the current, on the canals by towing horses. From Milan the flotilla proceeded by canal to Pavia, and from Pavia down stream to Piacenza, at every station commanding the highest admiration. The experiment — the first of its kind ever made — is a worthy complement to the mountain ambulance of the Italian Red Cross Association.

— A large number of migratory birds passed over Dublin during the night of May 4 last, on the way to their northern breeding-haunts. An account of the matter is given by Mr. Allan Ellison in a recent number of the *Zoologist*. "While sitting in our rooms in Trinity College, about 11 P.M.," he says, "we were attracted by the loud call-notes of birds passing overhead. The night was calm and cloudy, not very dark. We listened at the open window until about 1 A.M., when they seemed to be still passing over in undiminished numbers. They were mostly golden plovers and dunlins, easily recognized by their notes, but we frequently heard the cry of the whimbrel, or the shrill call of the common sandpiper. It was most curious to hear these notes, at first far away towards the south-west, gradually becoming louder as the flocks drew nearer and passed overhead, and then rapidly passing away to the northward. Sometimes the whole air seemed full of their clear whistling notes; in one direction the loud, short pipe of the golden plover, in another the shrill wheezing cry of the dunlin, reminding one of the sound made by a whistle with a pea in it. Sometimes a bird or two would fly quite close over the house-tops, uttering its loud whistle close to the open window, but they seemed for the most part to fly at a great height."

— The Biological Club of the Ohio State University and Ohio Agricultural Experiment Station met Nov. 3, and elected the following officers to take their places at the next meeting: president, Professor W. A. Kellerman; vice-president, Professor F. M. Webster; secretary, C. M. Werner. The club is in a more flourishing condition and doing better work this fall than ever before. It is composed of over a score of professors and advanced students, mostly specialists. Some idea of a part of the work and workers may be gained from the following, which is the programme for this term: Sept. 23, "Notes on Personal Work and Reports on Recent Scientific Literature;" Oct. 7, Professor Kellicott, "On Certain Crustaceous Parasites of Some of Our Fresh-Water Fish;" Oct. 20, Professor Kellerman, "Germination Tests in Connection with the Use of Fungicides on Grain;" Nov. 3, Election of Officers; Annual Address by the President, Professor W. R. Lazenby; Nov. 17, Dr. Orton, "Geological History of the Black Shales of Columbus;" Dec. 1, Professor Webster, "The Relation between the Increase of certain Insects and the Overflow of Rivers;" Dec. 15, Professor Selby, "Ohio Oaks." During the remainder of the year the following subjects will be discussed: "Report of a Biological Survey of Ohio River Waters," by Dr. Bleile; "Methods of Propagation or Multiplication in the Lower Forms of Animal Life," by Professor Kellicott; "Methods of Propagation or Multiplication in the Lower Forms of Vegetable Life," by Professor Kellerman; "Protective Mimicry in Insects," by Professor Webster; "Palæozoic Mollusca, with Stages of Molluscan Development," by H. A. Surface; "The Botanical Order of Violaceæ," by E. E. Bogue;

"Some Observations of Animal Life in my Aquarium," by J. H. McGregor. Other professors and advanced students will deliver addresses or read papers, the subjects of which have not yet been given. Besides the regular paper at each meeting, there are notes on personal work, recent discoveries, investigations, etc., by the various members, and reports on current scientific literature. At the meeting Nov. 3, the president, Professor Lazenby, recommended that immediate action be taken toward the formation of an Ohio State Academy of Science. The suggestion was acted upon at once, and a committee, consisting of Professor W. R. Lezenby, D. S. Kellicott, and W. A. Kellerman, was appointed to make further arrangements in this direction, and to correspond with scientific workers throughout the State with a view of securing their co-operation. Correspondence from all persons interested is earnestly solicited.

— It is reported that the decline in the supply of Bahia piassava still continues, and that the bark is becoming exceedingly scarce, owing to the reckless manner in which the trees are stripped. Bahia piassava, as is well known, is the fibre from the sheathing bases of the leaves of a palm (*Attalea funifera*), and is a most valuable material for the manufacture of bass brooms and brushes. A similar product, obtained from Para, is furnished by another palm, the *Leopoldinia piassava*. In consequence of the scarcity of these two commodities, attention has of late years been directed to other channels for substances that might compete with, or, at any rate, be used as a substitute for true piassava. One has been found in Madagascar, the fibres of which are, however, not sufficiently stiff or elastic to be used by themselves. Split cane, dyed brown to resemble piassava, has also been used, more, perhaps, for mixing with the real thing than to be used alone. But the most recent introduction, and one of very considerable importance, is that now known in commerce as African piassava, or Lagos bass. It differs from the other three kinds, inasmuch that, instead of being a fibrous coating or sheathing at the base of the leaves, it is the strong woody fibres of which the petiole, or leaf stalk, are built; and as the palm (*Raphia vinifera*) is now abundant in tropical Africa, the supply is practically inexhaustible. With this consideration, coupled with the fact that the substance continues to arrive in large quantities, and to meet with a very ready sale, it may be taken that African piassava is one of the most important of newly discovered vegetable products.

— The British East Africa Company have determined to make a complete survey of the district between the east coast of Africa and Victoria Nyanza, the vast inland sea. The idea of having a railway to this lake has been discussed for some time, and Sir John Fowler, on being appealed to, gave it as his opinion that a railway was practicable, and need not cost over two millions sterling. This opinion, of course, could only be formed on incomplete information, for while travellers, like Mr. Joseph Thomson, who has just returned from the interior of Africa, Dr. Fischer, and Count Teleki, have afforded information as to the nature of the country to be traversed, little is known about the formidable Mau escarpment and the country lying between that precipice and the lake. A thorough survey is therefore desirable, and the British East Africa Company, with commendable enterprise, have determined to send out a party, the chief of which will be Captain J. R. L. MacDonald, with Captain J. W. Pringle as assistant, both being officers of the Royal Engineers. Captain MacDonald is attached to the Indian Public Works Department, and has had much experience of railway surveying in India. The surveying party will leave England in about ten days, says *Engineering* of Oct. 30, and on arrival will separate into two or three sections. One party will proceed along the Sabaki River, and the other will start from Mombasa. Both will meet up the Sabaki and explore both banks. From Machakos the party will separate into three parties. The return will be *via* the Kampéplain, so that eight months will probably be occupied in the work. It is hoped that the result of the survey will be the construction of a railway to the shores of the lake, as by this means it will be possible to open up a very large tract of virgin country for trading purposes. But we do not know that the opinion will be equally unanimous as to the railway being made by the government. The British East

Africa Company will profit most largely, and ~~surely~~ they should bear the financial risk, if there be any. In any case the survey must have valuable results, as it will afford definite information of that part of Africa, regarding which so little is known and in which so much interest is taken.

— Positive photographs can be obtained direct from the camera, as announced by J. Waterhouse, in "Eder's Jahrbuch," 1891, 283-287 (abstract in *Zeitsch. Physik. Chemie*, VIII., 567). This remarkable result is secured by adding small quantities (about one-fifth per mille) of a substituted sulpho-urea to the developer. Experiments were made with allyl and phenyl sulpho-urea added to eikonogen. Sulpho-urea itself acts similarly, but without satisfactory results. All these substances are powerful accelerators.

— A very simple method of laying the foundations on a swampy location, which did not furnish a firm subsoil, was employed by an American engineer, according to *Engineering*, for supporting a low wooden building to be used for storage of machinery. Casks were set in holes in the ground along the line of posts and were filled to the depth of about one foot with iron turnings. The posts were set in the casks, which were then filled with iron turnings compactly rammed in place. A solution of salt and water was then slowly poured over these turnings, which compactly solidified into a hard mass. The heat of the oxidation of the iron was so great that the posts smoked and were charred; the latter fact probably being the reason why they have not as yet exhibited any signs of decay; and in this respect the use of iron turnings furnishes an advantage over the use of concrete for cask foundations.

— Perhaps the strangest instance of the forced wanderings of a petrel was that which brought one of the last-known members of an extinct, or at any rate a lost species, the capped petrel, whose only home appears to have been the islands of St. Domingo and Guadaloupe, from the West India seas to a Norfolk heath. In March or April, 1850, according to the *London Spectator*, Oct 31, a bird was seen by a boy on a heath at Southacre, in Norfolk, flapping from one furze-bush to another, until it crept into one, and was there caught by him. Exhausted as it was, it violently bit his hand, and he thereupon killed it. A Mr. Newcome, one of a race of falconers, happened to be hawking in the neighborhood, and his falconer, seeing the boy with the dead bird, brought it to his master, by whom it was skinned and stuffed, and placed in the Newcome collection, where it still remains. It was a large bird, about sixteen inches in length, with long, curved wings characteristic of all the petrels, and a black head, as its name indicates. Only two other instances of the capped petrel's appearance in Europe are known. One was shot near Boulogne, and one in Hungary, in 1870, which is in the museum at Buda-Pesth. Two others have been taken in the United States. But the strangest part of the story is that the capped petrels are now either extinct, or lost to the knowledge of man. "It is certain," says Mr. Stevenson, in his last and unfinished volume of "The Birds of Norfolk," "that the true home of this very rare species is, or was, in the islands of Guadaloupe and Dominica, in the West Indies, where it was formerly very abundant; but one of its old breeding-places in the last-named of these islands was explored, without finding a single bird, in February, 1887, by Colonel Feilden." It appears that ten years before, not only Dominica, but also Guadaloupe, was searched in vain for the "Diablotins," the name by which these petrels were known to the old voyagers. It is believed that they were possibly destroyed by a South American opossum which was introduced to the island; but as the young and even the old birds were constantly caught by the islanders for food in the holes in which they nested, their destruction may be due, like that of the great auk, to human greediness.

— Morgan R. Sanford, formerly of the Kansas Wesleyan University, has been elected professor of science in the school at Wilbraham, Mass.

— Mr. Charles Darwin of the United States Geological Survey has been appointed to investigate the tin mining industry of California, and has already proceeded to the scene of operations.

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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

MADSTONES AND THEIR MAGIC.¹

FOR centuries many accounts have been current regarding the virtues, real or imaginary, of certain bodies known as snake stones and madstones, which are asserted to have the power of absorbing poisons from wounds. The literature of two hundred years ago contains references to these substances; and even now some persons have a lingering belief in their efficacy. The subject is a curious one, and a brief account of it may be of interest, particularly of the origin and identification of one of these peculiar bodies.

Jean Baptiste Tavernier, the great oriental traveller of the seventh century, in his "Travels in India" (see Dr. Valentine Ball's translation in two volumes, London and New York, 1889, pp. lxx. 429; xix. 496) says: "I will finally make mention of the snake stone, which is nearly of the size of a double doubloon (a Spanish gold coin), some of them tending to an oval shape, being thick in the middle and becoming thin toward the edges. The Indians say that it grows on the heads of certain snakes, but I should rather believe that it is the priests of the idolaters who make them think so, and that this stone is a composition which is made of certain drugs. Whatever it may be, it has an excellent virtue in extracting all the poison when one has been bitten by a poisonous animal. If the part bitten is not punctured, it is necessary to make an incision so that the blood may flow; and when the stone has been applied to it, it does not fall off until it has extracted all the venom, which is drawn to it. In order to clean it it is steeped in woman's milk, or, in default of it, in that of a cow; and after having been steeped for ten or twelve hours, the milk, which has absorbed all the venom, assumes the color of madder. One day when I dined with the Archbishop of Goa, he took me into his museum, where he had many curiosities. Among other things he showed me one of these stones, and, in telling me of its properties, assured me that it was but three days since he had made a trial of it, after which he presented it to me. As he traversed a marsh on the island of Salsette, upon

which Goa is situated, on his way to a house in the country, one of his palanquin bearers, who was almost naked, was bitten by a serpent, and was at once cured by this stone. I have bought many of them, and it is that which makes me think that they make them. You employ two methods to ascertain if the snake stone is good and that there is no fraud. The first is by placing the stone in the mouth, for then, if it is good, it leaps and attaches itself immediately to the palate. The other is to place it in a glassful of water, and immediately, if it is genuine, the water begins to boil."

Thevenot says, in his "Voyages," p. 94, that snake stones were made of the ashes of the root of a certain plant, mixed with a particular kind of clay. Some snake stones appear to have been made of charred bone (see, for an exhaustive account of this subject, Yule-Burnell, "Anglo-Indian Glossary"). The belief in their efficacy is still very general in India; by some they are supposed to be found in the head of the adjutant bird (see "Jungle Life in India," p. 83).

Francisco Redi describes, in his "Experimenta" (Amsterdam, 1685, pp. 4 to 8), the extraordinary healing power attributed to stones obtained from the heads of certain serpents, called by the French "cobras de capello," found throughout Hindostan and Farther India. These stones are claimed to be an infallible remedy for the bites and stings of all kinds of venomous reptiles or animals, and likewise for wounds made by poisoned arrows, etc. He repeats the usual tales of their adhering powerfully when applied to the bite or wound, and clinging to it like a cupping-glass until they had absorbed all the poison, when they would fall off spontaneously, leaving the man or animal sound and free. Then follows the account of steeping the stones in milk to remove the poison, the milk assuming a color between yellow and green. These wonderful stones and the narrations concerning them had been brought to Italy by Catholic missionaries, who seem to have entire faith in their powers; so that Redi says they offered to prove the accounts by any number of experiments, such as would satisfy the most incredulous, and prove to medical men that Galen was correct when he wrote (chapter xiv. book I.) that certain medicines attract poison as the magnet does iron. For this purpose a search for vipers, etc., was recommended; but, owing to the season being later and colder than usual, none could at that time be obtained, as they had not emerged from their winter quarters. An experiment was therefore substituted, after much consultation among the learned men of the Academy of Pisa, whereby oil of tobacco was introduced into the leg of a rooster. This was regarded as one of the most fatal of such substances, and was administered by impregnating a thread with it to the width of four fingers and drawing it through the punctured wound. One of the monks forthwith applied the stone, which behaved in the regular manner described. The bird did not recover, but it survived eight hours, to the admiration of the monks and other spectators of the experiment.

Redi states that he himself possessed some of these stones, and also Vincent Sandrinus, one of the most learned herbalists of Pisa. Redi describes them as "always lenticular in form, varying somewhat in size, but in general about as large as a farthing, more or less. In color some are black like Lydian stone, tinged at times with a reddish lustre others white, others black, with an ashy hue on one side or both," etc.

Up to the present time no one has apparently identified what Tavernier referred to in speaking of snake stone. I however, occurred to the writer, after receiving a quant

¹ This article also appeared in the New York Sun.

of tabasheer from Dr. F. H. Mallet of the Geological Survey of India, who obtained it at the bazaar of the Calcutta Fair in November of 1888, that the Indian snake stone is evidently tabasheer. Tabasheer is a variety of opal that is found in the joints of certain species of bamboo in Hindostan, Burmah, and South America; it is originally a juice, which by evaporation changes into a mucilaginous state, then becomes a solid substance. It ranges from translucent to opaque in color. I found it either white or bluish-white by reflected light, and pale yellow or slight sherry red by transmitted light. Upon fracture it breaks into irregular pieces like starch. As in Tavernier's account of its clinging to the palate and causing water to boil when immersed, it actually has the property of strongly adhering to the tongue, and when put into water emits rapid streams of minute bubbles of air. It has a strong siliceous odor, but after absorbing an equal bulk of water becomes transparent like a Colorado hydrophane described by the writer several years ago before the New York Academy of Sciences.

Although tabasheer is mentioned in nearly all the textbooks, very little of it has reached the United States. It is highly interesting, since we have here an organic product scarcely to be distinguished from a similar opal-like body found by Mr. Arnold Hague in the geysers of the Yellowstone Park. Both tabasheer and the hydrophane were probably what was called "Oculus Beli," "Oculus Mundi," and "Lapis mutabilis" by Thomas Nicol, Robert Boyle, and other writers of the seventeenth century, and "Weltauge" by the Germans.

The great capacity of this substance for absorbing a fluid would undoubtedly render it as efficacious for the purpose of absorbing poison as any other known stone, providing the wound is open enough; and its internal use to-day as a medicine is possibly also due to this property.

Tabasheer, as known among mineralogists, is a corruption of the word tabixir, a name which was used even in the time of Avicenna, the Grand Vizier and body surgeon of the Sultan of Persia in the tenth century. It played a very important part in medicine during the middle ages. As to its origin, Sir David Brewster¹ says that tabasheer is only formed in diseased or injured bamboo joints or stalks.

Guibourt² differs from Brewster, inasmuch as he attributes the different rates of growth to the fact that when there is a superabundance of sap the tabasheer is formed from the residuum. More recently, Henry Cecil³ says, "In the onrush of tropical growth in the young shoot, nature, after flooring the knot, has poured in, as it were, sap and silica sufficient for a normal length and width of stem to the knot next above it. But by some check to the impulse, or by irregularity of conditions, the portion of stem thus provided for is shorter or narrower than intended, and the unused silica is left behind as a sediment, compacted by the drying residuum sap."

This latter view is sustained by Dr. Ernst Huth in his elaborate description of this substance, entitled "Der Tabixir in seiner Bedeutung für die Botanik, Mineralogie, und Physik; X. Sammlung Naturwissenschaftlicher Vorträge, herausgegeben von Dr. Ernst Huth, Berlin, 1887."

In this article Dr. Huth discusses the name, history, origin, and reputed virtues of this substance with much fullness. In regard to its use in medicine during the middle

ages, he quotes a remarkable list of applications to the ills that flesh is heir to.

Here it is cited as a remedy for affections of the eyes, the chest, and of the stomach, for coughs, fevers, and biliary complaints, and especially for melancholia arising from solitude, dread of the past, and fears for the future. Other writers speak of its use in bilious fevers and dysentery, internal and external heat, and a variety of injuries and maladies.

The writer has examined a large number of so-called madstones, and they have all proved to be an aluminous shale or other absorptive substance. But tabasheer possesses absorptive properties to a greater degree than any other mineral substance that I have examined, and it is strange that it has never been mentioned as being used as an antidote. It may be confidentially recommended to the credence of any person who may desire to believe in a madstone.

GEORGE FREDERICK KUNZ.

THE PLANT-BEARING DEPOSITS OF THE AMERICAN TRIAS.¹

The plant-bearing deposits of the American Trias are, so far as known, confined to two general regions, viz., a series of troughs in the piedmont region of the Atlantic slope extending from Massachusetts to North Carolina, and a great basin or area in the territories of New Mexico and Arizona. The character and structural relations of these rocks have been fully discussed by numerous writers. It is proposed in this paper to examine the evidence of the fossil plants as to their geological position. This evidence may be considered from two points of view; first, as to the relative position of the several basins, areas, or plant-bearing portions; and, second, as to the general relations of the flora as a whole to other floras which resemble it sufficiently to admit of comparison.

In looking at the subject from the first of these two points of view, or that of the American distribution, it is convenient to divide the general terrane into five geographical areas corresponding nearly with so many geological basins, viz., first, that of the Connecticut valley; second, the area that extends with little interruption from the Hudson River to near Charlottesville, Virginia; third, the Richmond coalfield; fourth, the North Carolina coalfield; and, fifth, the western area, which is not as yet sufficiently known to admit of subdivision.

The fossil plants have nearly all been found in the Connecticut valley, the Richmond coalfield, the North Carolina coalfield, and about the copper mines of New Mexico; a few came from New Jersey, Pennsylvania, and Maryland, while only silicified trunks have thus far been discovered in Arizona. All the material that has been found has been carefully studied and as accurately determined as its nature will permit. The greatest abundance of vegetable remains occurs in the Richmond and North Carolina coalfields.

A careful comparison of all the forms shows that out of a total of a hundred and nineteen species eighty-five are confined to some one of the areas above enumerated, leaving only thirty-four that occur in two or more of them. Tables of the distribution of species with full analysis of their relations and significance are given in the paper. As a general result, it is found that none of the basins except that of the

¹ Edinburgh Philos. Journal, No. 1, p. 147; Philos. Trans., cix., p. 283; and "The Natural History and Properties of Tabasheer," 1828; Edinburgh Journal, viii., p. 288.

² Jour. de Pharmacies, xxvii., pp. 81, 161, 252; and Phil. Mag., x., p. 229.

³ Nature, xxxv., p. 437.

¹ Read by title, by Lester F. Ward, before Section E of the American Association for the Advancement of Science, at Washington, D.C., Aug. 21, 1891; and in full before the Geological Society of America, at the same place, Aug. 24, 1891.

west contains less than thirty-nine per cent of species common to it and some one or more of the other basins, and that one of them, viz., that of New Jersey and Pennsylvania, has seventy-two per cent of its plants common to other basins, while that of North Carolina has fifty-two per cent, and that of Virginia thirty-nine per cent. All who are familiar with the evidence from fossil floras must therefore admit that it is strongly in favor of the general parallelism of the four eastern basins, while the minerals are too scanty to base a safe conclusion upon relative to the great western area with fifteen per cent of its species common to it and the eastern deposits.

Considering the subject from the second point of view above mentioned, or that of the foreign distribution, it is found that forty of the hundred and nineteen species occur in other deposits of the world, while seventeen others are represented elsewhere by closely related forms, giving fifty-seven of what may be termed diagnostic species. Omitting all details as before, it appears that the largest number of these, viz., thirty-two, occur in beds that have been authoritatively referred to the Keuper of Old World nomenclature, the Rhetic coming next, with thirty-one, followed by the Lias with twenty, and the Oolite with nineteen.

The general conclusion, therefore, is that, so far as the evidence from fossil plants goes, the precise horizon, relatively to the European deposits, of our American older Mesozoic plant-bearing rocks must be at the summit of the Triassic system, with their nearest representatives in the Keuper of Lunz in Australia and at Neue Welt near Basle, in Switzerland; while there is also a close affinity in the types to those of the Rhetic of Franconia and South Sweden.

BIRDS IN HIGH GALES.

At first it seems difficult, says the *London Spectator*, Oct. 31, to believe that the petrels, gifted with such powers of flight that, like their first cousins, the albatrosses, they make the central ocean their chosen home, should so far succumb to the Atlantic storms as to fall wholly under the dominion of the wind, and drift for thousands of miles to unknown and inhospitable shores. But any one who has watched the flight of a "lost" bird in a gale on land may form some idea of the danger to which the petrels are exposed when a hurricane bursts in the Atlantic.

Near Oxford, when the last gale was at its height, the writer was watching the "centre-board" rushing up and down over the floods on Port Meadow, with a strong current and the wind on their quarters; the geese were flying over the flood to avoid the canoes and small craft; and the wind was blowing a full gale from the south-west, with a brilliant sun, occasionally hidden by a white, drifting cloud. Far away to the north was a long-winged bird, beating up against the wind. At one time it rose high in the air, facing the gale; then it descended with a rapid swoop progressing westwards, but at the same time "falling off" still further to the north. It was a young herring gull, its checkered gray-and-white plumage showing clearly in the bright light as it approached. It was easy to conjecture from the gull's flight the power of storms to drive birds from the course which they aim at. The bird's point was clearly westward. It used every shelter and every lull of the wind to make it; but the gale was too powerful, and it appeared that it must either stay on the inhospitable land until the wind dropped, work its way slowly to the west with a rapid drift to the north, or abandon its struggle and drift with the wind.

But all birds seem to have an instinctive knowledge that if they once surrender to the force of the wind, and allow themselves to drift like leaves, there are unknown dangers in store for them. They will hardly ever do so unless to escape pursuit, and then only for a few minutes, when their pace is so marvellously rapid that, in the case of land-birds, a few minutes is sufficient to carry them out of the district they know into others from which they will perhaps never be able to find their way back to the fields which are their native home.

In the gale on Sept. 1 of the present year the writer saw a successful effort made by partridges to avoid the consequences of thus abandoning themselves to the gale. A covey of very strong birds, which had been hatched on the highest part of the Berkshire Downs, was flushed downwind, and, rising high in the air, the whole brood were carried in a few seconds to the extreme edge of the hill, below which was a sudden fall of some three hundred feet to a country quite unknown to these hill-birds. As they approached the limit of their own district, the partridges made an extraordinary effort to release themselves from the power of the wind, and to avoid being forced over the hill-top. Closing their wings, they sank almost to the ground, and so gained the slight shelter of a low bank. This enabled them to wheel, and so to face the gale. Even then they might not have achieved their object had not a small thorn-bush broken the force of the wind just on the edge of the down. The whole covey used the respite so given, and skimming up almost in single file, they alighted one by one behind the bush, on the extreme limit of their native ground. But recent instances are not wanting in which partridges have been carried out to sea when drifting on the wind. At Sizewell, in Suffolk, nine partridges were blown out to sea, and dropped in the water some four hundred yards from the shore; and in another case thirteen of the "red-legged" variety attempted the flight across the estuary of the Stour, and, falling exhausted, were picked up by some boatmen fishing for "dabs," a welcome and unlooked-for haul.

ASTRONOMICAL NOTES.

THE *English Mechanic* of Oct. 30 is authority for the statement that Dr. Hind, the superintendent of the English Nautical Almanac, will be succeeded by Mr. A. M. W. Downing, one of the chief assistants at the Greenwich Observatory, of which fact mention was made in a recent number of *Science*. The change will take place at the commencement of the coming year.

In *Knowledge* for November are given reproductions of four photographs, taken from a balloon by Mr. C. V. Shadbolt, in England. The several photographs were taken at a height of 500, 1,500, 2,100, and 6,000 feet, respectively. We understand that Mr. Shadbolt is the first to secure at these altitudes a recognizable plate.

Fathers Hagen and Fargis, astronomers connected with the Georgetown, D.C., Observatory, have just published a paper entitled "The Photochronograph and its Application to Star Transits." The aim of these gentlemen has been to secure an instrument that would photograph the transit of a star across the meridian. A reproduction of the transit of Sirius, as photographed, is given as an illustration of the work performed. In brief, the instrument these gentlemen have contrived consists of an electro-magnetic shutter, or "occulting bar," which is secured to the eye-end of the transit instrument. The apparatus is so formed that the current

pressing through a break circuit clock moves the occulting bar every second in such a way that the image of the star is for the instant allowed to form on the photographic plate behind this bar. The impression left by the star in transit is a row of dots, which are afterwards developed in the usual way. These dots are referred to the collimation axis of the telescope by means of a glass reticule plate, ruled with one vertical line. This plate is permanently fixed in the tube, directly in front of the sensitized surface, and touching it. After the star transit is over, the light from a lantern is allowed for a few seconds to fall upon the photographic plate, which gives an impression of this reference line. The row of dots which have just been photographed can not be "fogged" by this light, as they are shielded behind the occulting bar. After the plates are developed they are measured by the aid of a micrometer.

In the *Monthly Notices of the Royal Astronomical Society* (LI., No. 9), Professor Barnard of the Lick Observatory gives the result of his observation of Jupiter and his satellites during the year 1890, made with the 12-inch equatorial. One of the most interesting points in his paper is the fact that he saw the first satellite elongated in a direction nearly perpendicular to the belts of Jupiter. This observation was made on Sept. 8, 1890, when both Mr. Barnard and Mr. Burnham saw the satellite distinctly double. The distance between the two images was about 1", and at a position angle of 173°. Mr. Barnard gives two drawings, which represent the object as it appeared on two different dates. Two explanations are suggested. The first is that the satellite at the time of observation was crossed by a white belt parallel to those on Jupiter, or, second, that the satellite is actually double. We are strongly of the opinion that Mr. Barnard has solved his problem in his first assumption. This is explained in an article written subsequent to the one from which we have quoted. His assumption is that the satellite is crossed by a white belt, the remaining portion of the disk being dark. Now, should an object of this character transit a bright portion of Jupiter's surface, we would have the effect of two small, dark disks close together, which would appear round on account of irradiation and glare from such a bright object as the large planet. As the little moon passed across the face of Jupiter, the bright belt on the former would be lost in the bright surface of the latter. Now, if the satellite were to transit a dark portion of Jupiter's surface, we would have the opposite effect, that is, a white spot elongated in a direction parallel to the dark portion of Jupiter's surface on the large planet. Mr. Barnard, in the early fall, has reobserved these phenomena, and has found both of the conditions above mentioned fulfilled. However, these observations are very interesting, and only go to show that some of our large telescopes can be put to a good use in determining the markings on the satellites surrounding Jupiter, and assist in determining their period of rotation.

The following are the positions for comet Tempel-Swift. They are given for Paris midnight.

Date.	R. A.			Dec.	
	h.	m.	s.	°	'
Nov. 23	22	52	41	+17	22
25	23	4	6	18	27
27		16	9	19	30
29		28	48	20	33
Dec. 1	23	42	1	+21	34

The comet will reach its maximum degree of brightness on Nov. 23.

The following are the positions for Wolf's comet. They are given for Greenwich midnight.

Date.	R. A.			Dec.	
	h.	m.	s.	°	'
Nov. 18	4	32	53	-9	58
20		31	35	10	38
22		30	16	11	14
24		28	55	11	47
26		27	35	12	19
28		26	15	12	46
30	4	24	57	-13	11

The comet has now reached its nearest approach to the earth.

G. A. H.

LETTERS TO THE EDITOR.

* * Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The Man of the Future.

IN his criticism of my contribution to *Science* (Oct. 16) entitled "The Man of the Future," which was called forth by a former letter from Dr. Langdon (No. 452), Mr. Snell has expressed his views on the subject with great fulness and clarity (*Science*, Nov. 6). In several instances, however, the present writer can in no way agree with him, and as those points of disagreement are of prime importance, they will be briefly dwelt upon here. When Mr. Snell says that "The problem of human progress seems to have a fivefold aspect, physical, material, social, moral, and intellectual; and it therefore involves questions belonging to sciences as widely divergent as physiology, technology, sociology, and psychology" (p. 259), we must believe that biologists, as a rule, will not be fully in accord with him in the statement. Granting for the nonce that human progress has such a fivefold aspect, surely the consideration of his "physical" progress falls within the science of morphology rather than that of "physiology"; the "material" progress of man is quite secondary to the question at issue, and it hardly seems to be encompassed by the restricted science of "technology"; finally, strictly speaking, "psychology" is but a department of physiology, as sociology is of biology, and consequently both those sciences properly fall within the province of biology for treatment. Every biologist being more or less familiar with the factors in operation in the premises, we take it that the main object of the present discussion has to do more with a speculation upon the probable morphology of the man of the future, rather than it has to do with a discussion of the aforesaid factors, though undoubtedly in some instances it will be desirable to make somewhat extended reference to them.

As Mr. Snell remarks, he has not far to seek to find excellent authority to support his statement that "Although in the sub-human state the environment may have made the man, in the human state the man, generally speaking, makes his environment." But surely if this factor be in operation at all, which I do not fully deny, it is purely an exceptional one, and by no means the rule. In our estimation, it has been very much overrated by biologists. Take, for example, the ferine tribes the world over,—in what way do the majority of them "make their environment"? Many more than do the individuals in a community of beavers? Many tribes, apart from the mere possession of speech, pass an existence quite comparable with the lives led by some of the lower mammals in a state of nature. Coming up to the so-called semi-civilized races of the earth, the same principle in the main still holds true, although operative upon a somewhat higher plane. One may as well assert that the average Turk "makes his environment," and we may ask in what particular? If it be that he makes it, I, for one, should like to see the experiment of his attempting to step out of it. He probably would feel very much as the monkey does on the hand-organ or in the menagerie. Even in a highly civilized nation like our own, few there be indeed who really

understand what organic evolution means, much less to bring its laws into operation in an intelligent manner, so as to shape their own environment thereby, to the end that they keep upon the sole narrow track of true human progress. Improvement in education and its methods; improvement in human sanitation,—wear to me more and more the aspect of kinds of growths which man no more possesses the power of checking than he possesses the ability to stay the extinction of animals in nature, or even to arrest biologic evolution its very self.

The lesson taught us by the half-tried experiment in human stirpiculture by the Oneida Community was not, or rather should not be, entirely thrown away, nor do I believe that that experiment proved to be altogether a failure. To test its worth as a mode of race improvement it should be tried upon a much larger scale, in the fuller light of our more advanced scientific knowledge, and with the element of artificial selection not left out.

On the other hand, I cannot agree with our distinguished savant Professor Joseph Le Conte when he says that “if we are to have any race-improvement at all, the dreadful law of destruction of the weak and helpless must, with Spartan firmness, be carried out voluntarily and deliberately” (*The Monist*, vol. i., No. 3, Apr., 1891, p. 334); for I believe that it requires but a rigid enforcement of a law that will prevent the marrying of such individuals or their reproducing their kind at all, to soon bring about the desired result. While civilized man may be “making his own environment,” he certainly is not taking any rational steps at present to improve the race in that direction,—one of the most important of all. In ages to come I have an idea that such matters will be scientifically dealt with, and they were in my mind when I discussed the “man of the future” in my letter to *Science*, whereas Mr. Snell was surely dealing with the man of the present when he remarked upon this aspect of the case, that “the plan is fraught with collateral difficulties, and, even if these could be overcome, it seems to be forever out of the question, on account of the moral impossibility of obtaining for it, under any conceivable circumstances, the sanction of public opinion” (p. 259). And, assuredly with the man of the past when, in taking exception to my prediction of the abolition of war, he makes the somewhat isolated statement that “Chateaubriand, in his pamphlet ‘De Bonaparte et des Bourbons,’ calculated that more lives had been lost during the Napoleonic wars than during the whole of the Middle Ages throughout all Christendom.”

That long and destructive wars are gradually becoming less and less frequent seems to me to be but a matter of comparative history. National differences are now often adjusted without resort to bloodshed, which only a century or more ago would most certainly have given rise to a resort to arms. In short, warism and all that pertains to it is a relic of savagery, and with savagery must, in time, disappear.

The realization of this prediction, taken in connection with the disappearance of widespread and fatal epidemics of disease, which are likewise becoming less and less frequent, must of necessity have a powerful influence on the man of the future. By their elimination the world will certainly be more thickly and more quickly peopled with the human species. Mr. Snell has said nothing in his communication that has had a tendency to alter my opinion in reference to the destruction of the world's fauna and much of its present flora. I cannot conceive that “any portion of the flora or fauna of the globe which has even a picturesque or decorative value” as now existing, is destined to be seen by the “man of the future,” and alone represents the share which is not doomed to be destroyed. Possibly your correspondent would have me believe that some time in the future the day will arrive when all the habitable part of the globe will have been converted into one continuous, immense park, combined with biological preserves and enormous areas of dwellings and other habitations for the men of the future! It depends very much what is meant by the expression “picturesque or decorative value,” for to my mind biologic, and in face of the geological history of the world as now known to us, such an outcome is simply out of the question. To me, for example, there is no doubt but that the present existing avifauna of the world, or rather the entire group of those now highly specialized forms we

call birds, are destined to become utterly extinct in nature in the future history of the earth, and yet they certainly possess a certain “decorative value.” The largest or larger forms will first disappear, to be followed gradually by all those of less and lesser size. Our own avifauna is amply illustrative of this fact.

My critic said much in the leading paragraphs of his long communication that pleased me greatly; I refer especially to his remarks upon the growth of education; upon questions ethical and metaphysical; upon problems social and psychological, and upon morals; but I confess to my utter disappointment when I came to read further along in his article that he entertained such notions as “neither our senses nor our memories are as acute as those of our barbarian ancestors; our taste and capacity for intellectual speculation is not as great as was possessed by our predecessors of the scholastic period, or by the South Asiatic Aryans of any historic time;” and finally the statement, so tinged with pessimism, that “the low vice of avarice rules the day.” Were these statements true for the present hour, there could hardly be any doubt as to what some of the characteristics of the man of the future must be.

Mr. Snell unconditionally surrenders both sword and pen when he concludes by saying, “I cannot venture, in view of the complexity of the problem, to hazard a prediction even for the next stages of human evolution, to say nothing of the millions of years over which Dr. Shufeldt so gaily gambols.” Why, human “evolution” is the very pith of the question we are considering, and we biologists believe that we have so far solved the riddle of the origin of life upon earth, and the growth and development of animal and vegetable forms since, and the laws that control the same, that it is quite a pardonable thing for us to do, even if it be of “doubtful utility,” to forecast the fate of any vertebrate animal, man not excepted, into the future. A nineteenth century biologist, such as I am, is not likely to take umbrage at being charged with “gambolling over millions of years,” for I am become already callous to the charge of “gambolling” too many millions of years in the other direction, or into the *past*, in seeking into the question of the *origin of man* there. Indeed, I take no little pride in the fact that during the last ten years I have from time to time, as far as my poor ability would allow me, lent both my voice and pen to the view that man arose upon earth at a far remoter period in its history than a few *thousand* years amount to, as many eminently good people would yet have us to believe.

R. W. SHUFELDT.

Takoma, D.C., Nov. 17.

The International Geological Congress.

THE month of August, 1891, witnessed a remarkable gathering of scientific bodies at the capital. No less than nine organizations engaged in pursuits of a scientific character met in convention in Washington. From the 10th of August to the 2d of September the following bodies held meetings, partly successive and partly contemporaneous: the American Microscopical Society; the Association of American Agricultural Colleges and Experiment Stations; the Association of Official Agricultural Chemists; the Society for the Promotion of Agricultural Science; a conference of American chemists, with the Washington Chemical Society; the Association of Economic Entomologists; the American Association for the Advancement of Science; the Geological Society of America; and the Fifth International Congress of Geologists.

As one who enjoyed the privilege of attending and participating in the three last-named gatherings, I have brought together a few memoranda of some of the many points of interest connected therewith, especially in the department of geology.

The Association for the Advancement of Science, instead of continuing for a week, as its custom has been, closed its fortieth session on Saturday, Aug. 22, and gave up the Monday and Tuesday following to the American Geological Society. During the year previous, death had removed from the list of American geologists three eminent names,—E. W. Hilgard, Joseph Leidy, and Alexander Winchell, the last of whom was the president of the society for the year. The opening paper was a beautiful tribute to his work and worth, by his brother, Professor N. H. Winchell of Minneapolis.

One of the most interesting matters presented at these meetings was the paper of Mr. Charles D. Walcott on the discovery of undoubted fish-remains in strata of Ordovician (Lower Silurian) age, near Cañon City, Colorado. The occurrence of fishes in Upper Silurian beds has long been known in Europe, and in a few cases in this country; but it was a novel, and almost startling, change in our ordinary ideas to see these specimens of abundant ichthyic remains,—chiefly small granoidal plates and scales,—from a horizon corresponding to the Trenton limestone of the East.

The library of the Columbian University was converted into a room for geological exhibits, in which were arranged a very large number of specimens and appliances of much interest. The United States Geological Survey furnished a host of maps, reports, reliefs, photographs, etc., illustrating important features of American geology and the extensive character of the work in progress therein. Numerous maps and volumes were likewise displayed by State surveys, and by individual geologists; while many remarkable specimens and suites of specimens occupied table-cases throughout the room. Among these may be mentioned an extensive series of American rocks, brought by the representatives from that country; the Ordovician fish-remains above referred to, by Mr. Walcott; a most beautiful suite of the Tertiary insects from Florissant, Colorado, named and described by Professor Scudder; and, of peculiar interest, what appeared to be unquestionably glacial groovings from a Silurian rock-surface, exposed on removal of overlying strata,—thus indicating a glacial epoch far back in early Paleozoic time. These specimens, with views of the spot, were from a Scandinavian locality. Most of this interesting material was recorded in a pamphlet "Catalogue of Exhibits."

The general plan of the Geological Congress was to take up, for each day of the session, some one comprehensive subject, and after a full treatment of it by one or two members, to discuss it broadly and compare views, but not to attempt to decide upon mooted questions. This method was the result of experience in past meetings of the Congress, wherein it has come to be seen that little is gained by the attempt to pass judgment or formulate rules. Another interesting point was that, by general consent, the lead was taken by, or rather given to, our own geologists,—the foreign delegates, while participating largely in the discussions, coming to see, and hear, and learn.

The first subject was the classification of Pleistocene (Quaternary) deposits. The opening paper was by president T. C. Chamberlain, and was a comprehensive and exhaustive scheme of genetic classification of all the forms and types of superficial deposits immediately preceding the present period. The second day was given to the topic of correlation of sedimentary rocks, and was opened at length by Professor G. K. Gilbert of the United States Geological Survey, who described the several methods, both physical (by structure) and biotic (by fossils) available in identifying and correlating rocks. The discussion on this topic became very extended, going over into the next day, and was of great interest, in that many specialists in different departments presented their methods of work and their estimates of various means. Thus Professor von Zittel dwelt on the advantages of marine invertebrates, as compared with higher forms, or correlation; Professor Cope took up the gauntlet in behalf of vertebrata; and Dr. Lester F. Ward for fossil plants; while the physical methods of correlating and classifying strata were discussed by Professor McGee in an exposition of what is sometimes termed "the new geology," as applied to the coastal region of the Atlantic States, and by Professor Van Hise in a discussion of the great pre-Columbian series, now coming to be recognized and traced in the United States, under the name of Algonkian. The general view, however, emphasized the fact that all methods of correlation vary in value inversely as the geographical distance of the beds.

The next day was given to map-coloring and cartography. Here Major Powell, the head of the United States Geological Survey, naturally led the discussion, presenting a full account of the scheme adopted for the work of the survey, which is quite different from that proposed in 1885, at the Berlin meeting of the Congress. In the subsequent discussion, one fact, very strikingly developed, was the vastness of the scale on which the work of the American survey is conducted, as compared with those of Europe.

Indeed, this same aspect came often and strongly to view during the summer,—the immense field of geology in America, the vast areas to be connected and compared, the possibility of both methods and results, when "the whole boundless continent,"—of simple structure, and under a single government,—is to be dealt with, that are different from those of the Old World,—broader, grander, and more comprehensive.

D. S. MARTIN.

New York, Nov. 14.

Fifth International Congress of Geologists.

IN the current number of your journal (Nov. 6, 1891) is an article presenting Dr. Persifor Frazer's views upon the recent meeting of the International Congress at Washington. Dr. Frazer is of course at liberty to entertain such opinions with regard to the congress as he pleases, but in presenting an elaborate statistical table, as he has done here, he should at least endeavor to obtain accurate data.

Printed lists of names and addresses of members who had registered up to the fourth day of the congress were freely distributed to all who took part in the meetings. Some few belated foreigners registered after that date. Dr. Frazer's table ostensibly gives the comparative attendance at the five congresses, although he himself admits that no statistics have been given showing the actual attendance at the Paris congress. For the Washington congress he gives an attendance of 148 natives and 53 foreigners, as against 172 natives and 75 foreigners given by the printed lists above mentioned. Hence, of the four conclusions which he draws from his table, in point of fact all are incorrect, with the possible exception of the last, which I have not yet had time to verify.

S. F. EMMONS.

Washington, D.C., Nov. 12.

AMONG THE PUBLISHERS.

EARLY in 1892 Houghton, Mifflin, & Co. will publish under the title of "The Spirit of Modern Philosophy," the lectures given by Dr. Josiah Royce of Harvard in Cambridge last winter. The lectures were listened to with great interest, and, having been carefully revised, will form a work of remarkable value.

—Little, Brown, & Co. have nearly ready a new edition of Nuttall's "Hand-book of American Ornithology," brought down to date by Montague Chamberlain.

—A "Supplement to the Hand-Book of the American Academy" has just been published. It contains a list of the accessions to membership in the American Academy of Political and Social Science from Apr. 15 to Aug. 15, 545 names in all.

—Dextrine is the best substance for gumming labels. It may be purchased of almost any wholesale manufacturing chemist. It is mixed and stirred with boiling water until it obtains a consistency like ordinary mucilage, then applied to the back of the printed matter with a wide camel's-hair brush (care being taken to use paper that is not thin or unsized); after it becomes dry it is fit for use, being rendered exceedingly adhesive by a slight wetting.

—C. A. Starke, Görlitz, Prussia, has just published, says *The Publishers' Weekly*, the first number of *Ex-libris*, a journal devoted to the interests of collectors of book-plates in particular and to bookish matters in general, to be issued as often as the material in hand warrants making up a number. The first issue is almost entirely devoted to the subject-matter which gives the journal its title. It is a small quarto and handsomely printed.

—To extract grease spots from books or paper, gently warm the greased or spotted parts of the book or paper and then press upon it pieces of blotting-paper, one after another, so as to absorb as much of the grease as possible. Have ready some fine, clear essential oil of turpentine, heated almost to a boiling state; warm the greased leaf a little, and then with a soft, clean brush wet the heated turpentine both sides of the spotted part. By repeating this application the grease will be extracted, according to *The Publishers' Weekly*. Lastly, with another brush dipped in rectified spirits of wine, go over the place, and the grease will no longer appear, neither will the paper be discolored.

— D. Appleton & Co. announce "A Text-Book in Psychology," translated from the German of Johann F. Herbart. The central idea of the author's "attempt to found the science of psychology on experience, metaphysics, and mathematics," is *apperception* — recognition and comparison of features of an object with which we are familiar — in contradistinction to *perception*, in which an object is merely presented to our senses. The book makes the eighteenth volume in the International Education Series.

— A. C. Armstrong & Son, in conjunction with Elliott Stock, London, will publish the Camden Library, a series of volumes "concerned with the antiquities of Great Britain," and edited by G. Laurence Gomme and T. Fairman Ordish. The first volume, just ready, deals with the "Antiquities and Curiosities of the Exchequer," containing numerous illustrations from original MSS. and the various records preserved in the Public Record Office. Antiquities of the stage will be looked after in "Old London Theatres," and yet other volumes will be entitled "English Homes in the Past," "Monastic Arrangement," "English Armor," "Folk-Lore," "Church Plate," "The Streams of London," "Miniature Portrait Painting," etc.

— "Papers in Penology, second series," is a little pamphlet compiled by an inmate of the New York State Reformatory, and printed and stitched by other inmates of the same institution. It contains papers from various authors on the subject of prison re-

form, most of which have been published in some form before. It opens with three articles on the prisons of Great Britain, originally contributed to the *New York Times*, by Jay. S. Butler; and these are, perhaps, the most interesting in the whole collection. The other papers are on various aspects of the prison reform question, and written by Charles A. Collin, William T. Harris, Hamilton D. Wey, and Eugene Smith; while the last one of all is an account of "the Elmira Reformatory of To-day," by the editor of the pamphlet. This last is somewhat marred by a peculiar and rather grandiloquent style, but otherwise it is an excellent description of the reformatory methods now practised under the prison laws of the State of New York. Some of the writers carry their zeal for prison reform to an extravagant degree, and Mr. Collins in particular actually says in his last sentence that "the object of criminal punishment is the improvement of the offender." On the whole, however, the views here presented are sensible, and persons interested in the subject will like to possess the pamphlet.

— Harper & Brothers have just published "Pharaohs, Fellahs, and Explorers," by Amelia B. Edwards; and "Sharp Eyes, a Rambler's Calendar of Fifty-two Weeks among Insects, Birds, and Flowers," written and illustrated by W. Hamilton Gibson.

— Mr. J. H. T. McPherson has prepared a brief "History of Liberia," which will doubtless be of interest to students of the

Publications received at Editor's Office,
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- BALL, R. S. Starland. Boston, Ginn. 376 p. 12°. \$1.10.
PAPERS in Penology. Elmira, N. Y., State Reformatory. 148 p. 16°. \$1.
PICK, E. Pick's Method applied to Acquiring the French Language. Syracuse, N. Y., Bardeen. 113 p. 12°. \$1.
POOLE, J. The Practical Telephone Handbook. New York, Macmillan. 282 p. 12°. 75 cents.
POPE, F. L. Modern Practice of the Electric Telegraph. (14th ed.) New York, Van Nostrand. 234 p. 8°. \$1.50.
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Nov. 7.—E. M. Gallaudet, Values in the Education of the Deaf; J. C. Gordon, The New Departure at Kendall Green.

Chemical Society of Washington.

Nov. 12.—W. H. Krug, Estimation of Iron, Alumina, and Phosphoric Acid; H. W. Wiley and W. H. Krug, The Occurrence of Artificial Crystals of Calcium Phosphate; H. W. Wiley and W. H. Krug, A New Butter Adulterant; Cabel Whitehead, The Uses of Cadmium in Assaying Gold Bullion.

Biological Society, Washington.

Nov. 14.—T. S. Palmer, Winter Aspects of the Mojave Desert Region; V. A. Moore, A Case of Echinococcus in Swine; C. W. Stiles, Notes on Parasites:—Coccidium bigeminum Stiles; L. F. Ward, Haeckel's Radiolaria of the Challenger Expedition; L. F. Ward, Three Days in the Tropics.

Engineer's Club of Philadelphia.

Oct. 17.—B. E. Fernow, Tests of Timber now being made under the auspices of the Agricultural Department; F. H. Lewis, Soft Steel in Bridges.

Boston Society of Natural History.

Nov. 4.—G. L. Goodale, The Nature History Museums of Australasia; Warren Upham, Recent Fossils of the Harbor and Back Bay, Boston.

Nov. 18.—George Baur, A Visit to the Galapagos Islands; W. M. Davis, The Catskill Delta in the Post-Glacial Hudson Estuary.

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Nov. 11.—J. B. Harrison, Open Spaces for Public Resort.

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fears, the little republic should eventually be brought under the sovereignty of Great Britain. Mr. McPherson's pamphlet is published by the Johns Hopkins Press, at fifty cents.

— It is not, says *Iron*, generally known that the light of the sun and the moon exercises a deleterious effect on edge tools. Knives, drills, scythes, and sickles assume a blue color if they are exposed for some time to the light and heat of the sun; the sharp edge disappears, and the tool is rendered absolutely useless until it is retempered. A similarly prejudicial effect has been exercised by moonlight.

— Steps have been taken, we learn from *The Publisher's Weekly*, to establish an "Authors' Museum" in St. Petersburg, to contain mementos and relics of famous Russian literary men and women. It is probable that the Puschkin Museum in the Lyceum, and the Sermonoff Museum in the Nikolai Cavalry School, will be incorporated in the new institution, if completed.

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